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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/716,785 | 11/19/2003 | Wu-Song Huang | FIS920030377US1 | 6138 |

32074 7590 03/04/2005

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EXAMINER

LEE, SIN J

ART UNIT PAPER NUMBER

1752

DATE MAILED: 03/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/716,785

Applicant(s)

HUANG ET AL.

Examiner

Sin J. Lee

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/19/2003.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

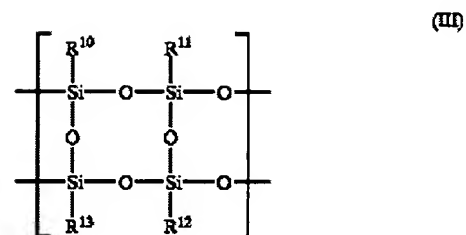
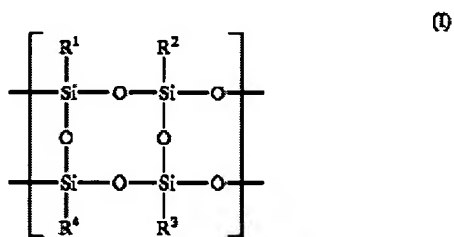
1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

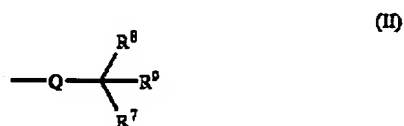
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4, 10, 11-18, 24-27, and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Sooriyakumaran et al (US 2002/0081520 A1).

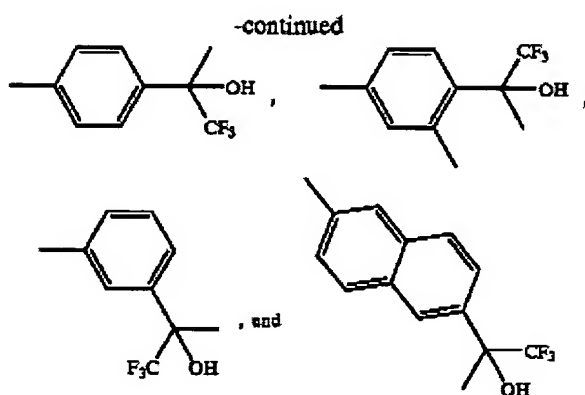
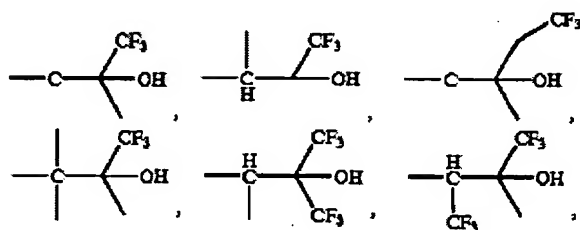
Sooriyakumaran teaches ([0048], [0044], [0045]) a *fluorocarinol* functionalized *silsesquioxane* copolymer comprised of structure (I) monomer units and monomer units having structure (III):



In the structure (I), R¹-R⁴ are independently substituents having following structure (II):



, and Sooriyakumaran teaches ([0047]) following examples for the structure (II):



In the structure (III), at least one of R^{10-13} is an acid-cleavable moiety (see [0049]). As one of the examples for the acid-cleavable moiety, Sooriyakumaran discloses (see [0051]) a *tetrahydropyranyloxy group (which is a cyclic acetal group)*.

Sooriyakumaran also teaches a photoacid generator as the second component of his resist composition (see [0056]).

Therefore, Sooriyakumaran teaches present inventions of claims 1-4 and 10.

With respect to present claim 11, Sooriyakumaran teaches ([0055]) that his copolymer generally has an average Mw in the range of 1,000 to 5,000. Therefore, the

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prior art teaches present invention of claim 11. As stated in In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), "the disclosure in the prior art of any value within a claimed range is an anticipation of that range."

Sooriyakumaran teaches ([0075]) a process for generating a resist image on a substrate which comprises the steps of: (a) coating a substrate with a film comprising his resist composition; (b) imagewise exposing the film to radiation; and (c) developing the image. Sooriyakumaran teaches ([0080]) that the pattern from the resist structure may then be transferred to the material of the underlying substrate by etching.

Sooriyakumaran also teaches a post-exposure baking step (see [109]). Therefore, the prior art teaches present inventions of claims 14-18, 24, and 30.

With respect to present claim 27, Sooriyakumaran teaches that a bilayer substrate may be employed in which his resist composition forms an upper resist layer on top of a bilayer substrate comprised of a base layer and underlayer that lies between the upper resist layer and the base layer. Thus, the prior art teaches present invention of claim 27.

With respect to present claims 12, 13, 25, and 26, in his Example 3, Sooriyakumaran teaches partial protection of poly(2-hydroxy-3,3,3-trifluoropropylsilsesquioxane) with acid-cleavable trimethylsilyl group. Sooriyakumaran teaches the equivalence of the trimethylsilyl group with the tetrahydropyranyl oxy group (see [0051]). Based on this teaching, one of ordinary skill in the art would immediately envisage partial protection of poly(2-hydroxy-3,3,3-trifluoropropylsilsesquioxane) with acid-cleavable tetrahydropyranyl oxy group. Such polymer comprises present

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combination of monomeric units (II) and (III); *in the formula (III)*, X would be a methylene group, R³ would be a H atom, R⁴ would be –CF₃ (a fluorinated alkyl group), q would be 0, and R⁶ would be –OH (a solubility promoting group). In the formula (II), X would be a methylene group, R³ would be a H atom, R⁴ would be –CF₃ (a fluorinated alkyl group), q would be 0, and R⁵ would be tetrahydropyranyl oxy group (present solubility inhibiting cyclic ketal group). Also, such polymer comprises present combination of monomeric units (II) and (V); in the formula (V), X would be a methylene group, one R³ would be a H atom, another R³ would be –CF₃ (a halogenated alkyl group), q would be 0, and R⁶ would be –OH (a solubility promoting group). Therefore, Sooriyakumaran teaches present inventions of claims 12, 13, 25, and 26.

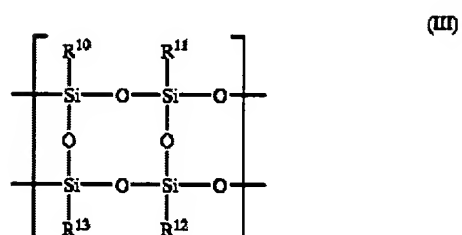
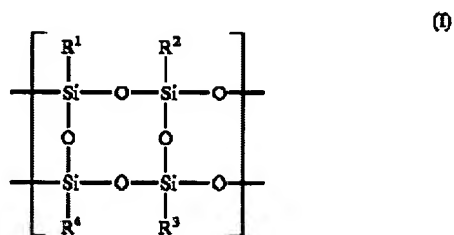
Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

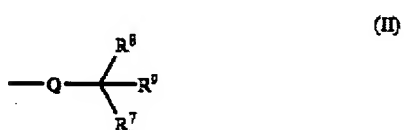
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-27 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sooriyakumaran et al (US 2002/0081520 A1) in view of Bucchignano et al (6,037,097).

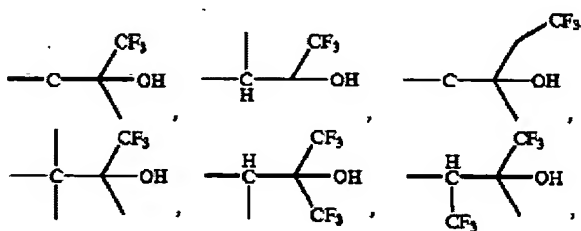
Sooriyakumaran teaches ([0048], [0044], [0045]) a *fluorocarinol* functionalized *silsesquioxane* copolymer comprised of structure (I) monomer units and monomer units having structure (III):

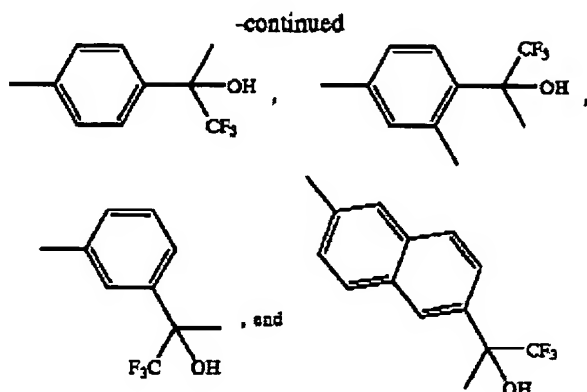


In the structure (I), R¹-R⁴ are independently substituents having following structure (II):



, and Sooriyakumaran teaches ([0047]) following examples for the structure (II):





Sooriyakumaran teaches that in the structure (III), at least one of R^{10-13} is an acid-cleavable moiety (see [0049]). Sooriyakumaran furthermore teaches (see [0050]) that suitable acid-cleavable functionality includes ethers of the formula $-OR^{16}$, in which R^{16} is an acid-cleavable functionality. Sooriyakumaran also teaches a photoacid generator as the second component of his resist composition (see [0056]).

Bucchignano teaches (col.2, lines 21-29, lines 35-53) that by using a cyclic aliphatic ketal substituent as an acid labile protecting group for an aqueous base soluble copolymer, one can obtain a chemically amplified resist that provides improved resist coating shelf life and with little or no vacuum effects on use and that prevents air-borne contaminants from adversely affecting the chemical nature of the aqueous base soluble copolymer. Bucchignano teaches a methoxycyclohexanyl group as a highly preferred example for the unsubstituted cyclic aliphatic ketals (see col.4, lines 37-50).

Bucchignano also teaches (col.4, lines 51-58) that hydrogen of the cycloaliphatic portions of the ketal substituent can be substituted with hydrophobic groups such as $-CF_3$, $-CHF_2$, $-CH_2F$, $-CCl_3$, $-CHCl_2$, $-CH_2Cl$, and $-Si(CH_3)_3$.

In view of Bucchignano's teaching, it would have been obvious to one of ordinary skill in the art to use $-OR^{16}$ group as Sooriyakumaran's acid-cleavable group in structure (III), in which R^{16} represents either methoxycyclohexanyl group (the $-OR^{16}$ group, in which R^{16} is methoxycyclohexanyl group, teaches present first formula of claim 6) or methoxycyclohexanyl group substituted with CF_3 , $-CHF_2$, $-CH_2F$, $-CCl_3$, $-CHCl_2$, $-CH_2Cl$, or $-Si(CH_3)_3$, in order to obtain a chemically amplified resist that provides improved resist coating shelf life and with little or no vacuum effects on use and that prevents air-borne contaminants from adversely affecting the chemical nature of the aqueous base soluble copolymer as taught by Bucchignano. Therefore, Sooriyakumaran in view of Bucchignano would render obvious present inventions of claims 1-10.

With respect to present claim 11, Sooriyakumaran teaches ([0055]) that his copolymer generally has an average Mw in the range of 1,000 to 5,000. Therefore, Sooriyakumaran in view of Bucchignano would render obvious present invention of claim 11.

Sooriyakumaran teaches ([0075]) a process for generating a resist image on a substrate which comprises the steps of: (a) coating a substrate with a film comprising his resist composition; (b) imagewise exposing the film to radiation; and (c) developing the image. Sooriyakumaran teaches ([0080]) that the pattern from the resist structure may then be transferred to the material of the underlying substrate by etching. Sooriyakumaran also teaches a post-exposure baking step (see [109]). Therefore,

Sooriyakumaran in view of Bucchignano would render obvious present inventions of claims 14-24 and 30.

With respect to present claim 27, Sooriyakumaran teaches that a bilayer substrate may be employed in which his resist composition forms an upper resist layer on top of a bilayer substrate comprised of a base layer and underlayer that lies between the upper resist layer and the base layer. Thus, Sooriyakumaran in view of Bucchignano would render obvious present invention of claim 27.

With respect to present claims 12, 13, 25, and 26, in his Example 3, Sooriyakumaran teaches partial protection of poly(2-hydroxy-3,3,3-trifluoropropylsilsesquioxane) with acid-cleavable trimethylsilyl group. Based on Bucchignano's teaching (i.e., the use of a cyclic aliphatic ketal substituent as an acid labile protecting group for an aqueous base soluble copolymer provides a chemically amplified resist, which has improved resist coating shelf life and with little or no vacuum effects on use and which prevents air-borne contaminants from adversely effecting the chemical nature of the aqueous base soluble copolymer), it would have been obvious to one of ordinary skill in the art to partially protect Sooriyakumaran's poly(2-hydroxy-3,3,3-trifluoropropylsilsesquioxane) with acid-cleavable cyclic aliphatic ketal substituent such as methoxycyclohexanyl group in order to obtain a chemically amplified resist, which has improved resist coating shelf life and with little or no vacuum effects on use and which prevents air-borne contaminants from adversely effecting the chemical nature of the aqueous base soluble copolymer. Such polymer comprises present combination of monomeric units (II) and (III); *in the formula (III)*, X would be a methylene group, R³

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would be a H atom, R^4 would be $-CF_3$ (a fluorinated alkyl group), q would be 0, and R^6 would be $-OH$ (a solubility promoting group). In the formula (II), X would be a methylene group, R^3 would be a H atom, R^4 would be $-CF_3$ (a fluorinated alkyl group), q would be 0, and R^5 would be methoxycyclohexanyl oxy group (present solubility inhibiting cyclic ketal group). Also, such polymer comprises present combination of monomeric units (II) and (V); in the formula (V), X would be a methylene group, one R^3 would be a H atom, another R^3 would be $-CF_3$ (a halogenated alkyl group), q would be 0, and R^6 would be $-OH$ (a solubility promoting group). Therefore, Sooriyakumaran in view of Bucchignano would render obvious present inventions of claims 12, 13, 25, and 26.

5. Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sooriyakumaran et al (US 2002/0081520 A1) in view of Khojasteh et al (US 2002/0058204 A1).

Sooriyakumaran is discussed above in Paragraph 2. As discussed above, Sooriyakumaran teaches that a bilayer substrate may be employed in which his resist composition forms an upper resist layer on top of a bilayer substrate comprised of a base layer and underlayer that lies between the upper resist layer and the base layer. Sooriyakumaran does not teach present underlayer composition of claim 28. Khojasteh teaches ([0009]-[0021]) an underlayer composition comprising (a) a polymer containing (i) cyclic ether moieties, (ii) saturated polycyclic moieties, and (iii) aromatic moieties, and (b) an acid generator, or an underlayer composition comprising (a) a polymer containing (i) saturated polycyclic moieties, and (ii) aromatic moieties, (b) an acid

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generator, and (c) a crosslinker. Khojasteh teaches that use of such an underlayer composition provide underlayers having outstanding optical, mechanical and etch selectivity properties ([0008]). In view of Khojasteh's teaching, it would have been obvious to one of ordinary skill in the art to use Khojasteh's underlayer composition for Sooriyakumaran's underlayer in order to obtain underlayer having outstanding optical, mechanical and etch selectivity properties as taught by Khojasteh. Khojasteh also teaches ([0058]) that the polymer of the underlayer composition preferably contains a fluorine components such as pentafluoroaryl group and trifluoromethyl group. Therefore, Sooriyakumaran in view of Khojasteh would render obvious present inventions of claims 28 and 29.

6. Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sooriyakumaran et al (US 2002/0081520 A1) in view of Bucchignano et al (6,037,097) as applied to claim 27 above, and further in view of Khojasteh et al (US 2002/0058204 A1).

Sooriyakumaran in view of Bucchignano is discussed above in Paragraph 4. As discussed above, Sooriyakumaran teaches that a bilayer substrate may be employed in which his resist composition forms an upper resist layer on top of a bilayer substrate comprised of a base layer and underlayer that lies between the upper resist layer and the base layer. Sooriyakumaran does not teach present underlayer composition of claim 28. Khojasteh teaches ([0009]-[0021]) an underlayer composition comprising (a) a polymer containing (i) cyclic ether moieties, (ii) saturated polycyclic moieties, and (iii) aromatic moieties, and (b) an acid generator, or an underlayer composition comprising

(a) a polymer containing (i) saturated polycyclic moieties, and (ii) aromatic moieties, (b) an acid generator, and (c) a crosslinker. Khojasteh teaches that use of such an underlayer composition provide underlayers having outstanding optical, mechanical and etch selectivity properties ([0008]). In view of Khojasteh's teaching, it would have been obvious to one of ordinary skill in the art to use Khojasteh's underlayer composition for Sooriyakumaran's underlayer in order to obtain underlayer having outstanding optical, mechanical and etch selectivity properties as taught by Khojasteh. Khojasteh also teaches ([0058]) that the polymer of the underlayer composition preferably contains a fluorine components such as pentafluoroaryl group and trifluoromethyl group. Therefore, Sooriyakumaran in view of Khojasteh and further in view of Khojasteh would render obvious present inventions of claims 28 and 29.

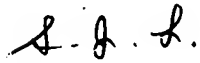
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

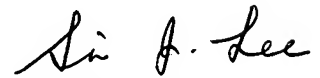
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Lee
March 2, 2005



Sin J. Lee
Patent Examiner
Technology Center 1700